SAGE III Ozone Loss and Validation Experiment

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The SAGE III Ozone Loss and Validation Experiment (SOLVE) campaign is cosponsored by the NASA Upper Atmosphere Research Program, the Atmospheric Effects of Aviation Project, the Atmospheric Chemistry Modeling and Analysis Program, the Earth Observing System Validation Program, and the European Science Commission. It is the largest field experiment ever conducted to examine stratospheric ozone levels over the Arctic region. The mission will be conducted during the 1999–2000 winter from Kiruna, Sweden, and will employ multiple aircraft, balloons, ground-based instruments, satellites, and an extensive theory team to examine the processes that control polar to midlatitude stratospheric ozone levels. The experiment will acquire correlative measurements needed to validate the Stratospheric Aerosol and Gas Experiment (SAGE) III satellite to help quantitatively assess high-latitude ozone loss. The results of the SOLVE campaign will both expand the understanding of polar ozone processes and provide greater confidence in current ozone monitoring capabilities.

Managed by the Earth Science Project Office at Ames Research Center, the SOLVE campaign includes over 350 scientists, engineers, and technicians from many NASA centers, other Government agencies, and universities across the world. More information, including the experiment overview, goals, schedule, instrument payloads, mission details, and science team members, can be found at the SOLVE Web page (http://cloud1.arc.nasa.gov/solve).

The first part of the SOLVE campaign began in November, 1999, with launches of in situ and remote stratospheric balloon payloads. These launches, just prior to the appearance of cold stratospheric temperatures below 195 K, enabled the experiment to obtain samples of the polar vortex in its initial condition prior to the appearance of polar stratospheric clouds (PSCs). These observations were important for interpreting the subsequent cold temperature chemistry and ozone loss later in the experiment.

The NASA DC-8 began its first deployment on December 1, 1999. The objective was to obtain remote measurements of the initial states for ozone (O_3), reactive nitrogen (NO_y), reactive chlorine (Cl_y) compounds, aerosols, and the nitric acid (HNO_3) and water (H_2O) vapors that will eventually condense to form PSCs. The DC-8, however, observed colder than normal temperatures in the early vortex lifetime, and observed Type-1a PSCs on several flights. Including the transits, the DC-8 had a total of eight successful flights and made the first coordinated science flight over Russia.

Jim Anderson (Harvard University), Paul Newman and Mark Schoeberl (NASA Goddard Space Flight Center), and Owen B. Toon (University of Colorado) collaborated in this research.

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Stratospheric Tracer-Field Measurements with a New Lightweight Instrument: The Argus Spectrometer

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Argus is a new, lightweight spectrometer designed for measuring the stratospheric nitrous oxide (N_2O) and methane (CH_4) tracer fields in situ from balloons and aircraft. It is a second-generation instrument drawing on the experience gained with the very successful Atmospheric Laboratory for Applications and Science (ATLAS) instrument measuring N_2O and flying on the NASA ER-2 since 1986.

During the past several years Argus was part of the Observations from the Middle Stratosphere (OMS) balloon payload probing the tropical and midlatitude stratosphere in studies of transport issues related to dispersion of aircraft exhaust. A major concern motivating these studies was the potential for nitrogen oxides (NO_x) generated in the exhaust plume of a supersonic high flyer to reach the tropical ozone production region by rapid transport from a